Investigation

Promoting support for community water fluoridation

Testing message effects and the role of normative beliefs

Deena Kemp, PhD; Michael Mackert, PhD; Lindsay Bouchacourt, MA; Allison J. Lazard, PhD; Josefine Ortiz Wolfe, PhD, RDH, CHES; Beth Stewart, RDH; LeeAnn Kahlor, PhD; Caren George, BS; Jessica Hughes Wagner, MPH, MCHES; Gary Wilcox, PhD

ABSTRACT

Background. Despite evidence that community water fluoridation (CWF) protects oral health, improves health equity, is safe and cost-effective, and contributes to social well-being, little is known regarding which of these benefits should be highlighted to effectively influence support for CWF.

Methods. This within-participants study examines differences in CWF support in response to pro-CWF messages reflecting themes of oral health, health equity, CWF safety, cost-effectiveness, or social well-being among a sample of parents. Prior belief that CWF has health benefits, worry about potential health risks, and normative beliefs were also examined as independent predictors of support for each theme.

Results. Oral health, health equity, and safety messages significantly increased support in comparison with social well-being messages ($P < .05$). Oral health messages also produced greater support than cost-savings messages. Belief that CWF has health benefits positively predicted support, as did normative beliefs that one's family and physician approve of CWF. Worry about health risks and community and dentist norms were not significant predictors of support. There were no interaction effects of message themes and prior beliefs.

Conclusions. Messaging focused on oral health, health equity, and the safety of CWF may be the most effective at influencing support for CWF. Preexisting personal beliefs about CWF benefits significantly predict support, but so do normative beliefs—family and physician norms in particular.

Practical Implications. Findings suggest dental health educators should emphasize the oral health benefits of CWF over cost and social well-being outcomes. They should also consider relevant norms and collaborate with family physicians to promote CWF.

Key Words. Community water fluoridation; dental public health messages; fluoride campaigns.

JADA 2021:■(■):■-■

https://doi.org/10.1016/j.adaj.2021.06.002

Community water fluoridation (CWF) has been recognized as one of the greatest public health success stories of the last 100 years.[1] Access to drinking water with optimal levels of fluoride reduces both caries and tooth loss.[2,3] CWF is particularly beneficial for young children still developing good oral hygiene practices and improves oral health outcomes among marginalized populations with limited access to other dental interventions.[4] In addition, CWF saves money for people and communities, and contributes to social well-being.[5,6]

Although nearly 75% of US residents using community water have access to CWF, the number of US cities opting to remove fluoride from their water has increased.[7] In Texas, only 68.8% of people served by community water systems had access to fluoridated water in 2017, down from 79% in 2014.[8] These trends can be attributed to a number of factors including lack of mandates requiring fluoridation, antifluoridation lobbying efforts, and limited public knowledge.[9] Most public information about fluoride is positive; however, a small segment of consumers have strong antifluoride convictions.[10,11] As polarizing as this issue can be, it appears the general public is not highly aware of CWF benefits, and public health communicators are uncertain about the best means of educating their communities.[12]

Health communication campaigns can play an important role in implementing CWF. However, few studies have examined public responses to messages about fluoridated water.[13] Informal evaluations of national and local campaigns provide some evidence of message effects.[14,15] Still, knowledge about the kinds of messages that promote support for CWF remains insufficient.

In this study, we compare differences in support for CWF in response to 5 message themes. These message themes are based on key areas of focus in the CWF research literature:

- the role of CWF in preventing caries and protecting oral health
- the safety of CWF[16]
- CWF's role in improving oral health for everyone regardless of dental health practices or access to care[17]
- CWF's cost-saving potentials[5]
- CWF's relationship to social well-being such as school performance and job outlook[6]

We also analyze the influence of personal beliefs and feelings and normative beliefs about CWF on the level of support in response to each message theme.

In an internal evaluation of their Children's Dental Campaign, the Pew Charitable Trusts noted that safety messages may have the unintended effect of raising questions about risks, and people were more willing to engage in conversations about social well-being.[15] This suggests certain message themes may be more effective than others. As far as we know, no prior research has examined the relationship among different message themes and support for CWF. The goal of our study is to determine whether messages about oral health, health equity, CWF safety, cost-effectiveness, or social well-being lead to varying levels of support for CWF (research question 1).

In addition to testing differences in CWF support based on message themes, we also examine whether preexisting beliefs, including normative beliefs, and feelings about fluoridated water predict responses. Believing that water fluoridation has health benefits has been shown to increase support for CWF.[18] At the same time, feelings of anxiety or worry that there may be health risks associated with fluoridated water have been found to decrease support.[19] In our study, we examine how these personal beliefs and feelings relate to the different aspects of CWF conveyed by each of the message themes. We expect that believing CWF has health benefits will positively predict CWF support (hypothesis 1]), whereas worry that CWF poses health risks should negatively predict support (hypothesis 2). However, beliefs about the benefits of CWF and worry about its potential risks may not be relevant when considering certain aspects of CWF. For instance, although it is likely that worry about health risks is related to responses to oral health messages, it is possible that it may not be a factor when considering the cost-effectiveness of CWF. In the absence of prior research indicating the nature of these relationships, we ask whether the pattern of effects for these 2 variables on CWF support differs across message themes (research question 2).

Although the relationship between beliefs about CWF and support of water fluoridation has been examined frequently,[10,18,19] the influence of normative beliefs—or perceptions of how important others view CWF—has not been widely considered.[20] Normative beliefs have been shown to positively influence a variety of health decisions including toothbrushing and other oral health practices.[21,22] Because CWF is a public rather than personal health intervention, it is likely that parents consider the approval of others within their social circles to guide their own decisions about the appropriateness of CWF. Normative perceptions, which we refer to as norms, can vary for specific social groups, and people may reference norms for some groups over others when considering a given behavior or aspect of a decision.[23] Accounting for the distinct influence of specific reference groups has been found to better predict and enhance the outcome of health communication interventions, such as those targeting binge drinking or exercise intentions.[24,25] In the context of CWF, relevant others may include family, the wider community, and health care professionals including dentists and family physicians. We expect beliefs, or norms, regarding how these relevant others view CWF will positively predict support (hypothesis 3) and ask whether the pattern of effects for each reference group differs across the message themes (research question 3).

METHODS

We conducted a within-participants survey experiment with a convenience sample of Texas parents via the Pollfish platform. Given the prevalence of caries in youth and concerns about the impact of fluoride on children, parents are a prime audience for CWF campaigns.[26]

ABBREVIATION KEY

CWF: Community water fluoridation.

Procedure

Study procedures received institutional review board approval (2019-02-0049). Data were collected from August through October 2019. Eligible participants were Texas residents who reported having children younger than 18 years. We excluded 21 respondents because they either did not report the ages of their children or reported ages as older than 18 years. After providing informed consent, participants responded to survey questions that included the personal belief, worry about CWF risks, and normative belief items before viewing the messages.

There were 21 messages in total, varying in terms of their focus: oral health, health equity, CWF safety, cost-effectiveness, or social well-being. Themes and messages were identified and developed on the basis of prior research and existing communication about CWF, as well as interviews with public oral health care professionals and dental educators. Table 1 provides all of the messages grouped by message theme. To reduce response burden, each participant only saw 13 messages. The first 6 messages were the same for all participants (n > 230 in Table 1); 7 messages were selected at random from the 15 remaining messages.

Measures

The dependent variable, *CWF support*, was measured on a 5-point scale asking how likely it was that each message would "*earn your support for water fluoridation in your community?*" This measure was repeated—participants responded to it after viewing each message. Responses ranged from 1 (very unlikely) to 5 (very likely) [mean (standard deviation {SD}), 3.41 (1.07)].

The personal belief items are independent predictors, rather than mediators, of support as they were asked before message exposure and were therefore not influenced by, but may have influenced, responses to the messages. Belief about CWF benefits was measured with the statement "*There are health benefits associated with fluoridated water*." Responses ranged from 1 (very unlikely) through 5 (very likely) [mean (SD), 3.50 (0.98)]. Worry about the risks associated with water fluoridation was measured with the statement "*I worry about potential health risks of fluoridated water*." Responses ranged from 1 (strongly disagree) to 5 (strongly agree) [mean (SD), 3.17 (1.04)].

Four items measured normative beliefs about whether referent others "*think fluoridated water is a good thing*." Responses ranged from 1 (strongly disagree) through 5 (strongly agree) for each referent group: *people in my family* [mean (SD), 3.31 (0.89)], *people in my community* [mean (SD), 3.29 (0.79)], *my family doctor* [mean (SD), 3.44 (0.84)], and *my dentist* [mean (SD), 3.56 (0.90)]. These group norm items are only moderately correlated (from $r = 0.45$ through $r = 0.67$), suggesting distinctions in how participants perceive each referent group. These items were analyzed as separate indicators of support as specific groups may have differential influence.

Demographic covariates

Participants reported their sex, racial and ethnic identity, age in years, level of education, and household income category. Participants also provided their ZIP Codes, which were converted to a binary rural or urban variable based on federal designations.[27] These demographic variables have been examined in connection with CWF beliefs and support in past research.[10,28]

Analytical approach

To answer our research questions and test our hypotheses, we ran linear mixed-effects regression models with message themes and prior beliefs as the predictor variables, CWF support as the outcome variable, and the demographic variables as covariates. The models also controlled for the effect of viewing the first 6 messages in nonrandom order. Data were analyzed with SPSS Version 26 (IBM) using a compound symmetrical covariance structure to model the dependencies within each participant's responses. The mixed-effects procedure treats each message as a unique observation under each theme. This allowed us to estimate the fixed effect of each theme while controlling for random effects due to differences among messages within a theme (such as differences in word count). All participants in our study had data missing at random for 8 of the 21 messages. Whereas repeated-measures analysis of variance cannot handle missing data, mixed-effects models allow for missing data in within-participants comparisons. In addition, the linear mixed model produces an approximately continuous, least-squares mean (LSM) value for each theme. Given the number of levels of our dependent variable, as well as the number of themes and messages within themes, this approach is more easily interpreted than comparing the results of ordinal logistic regression models.[29]

Table 1. Community water fluoridation test messages by message theme and mean community water fluoridation support rating.*

TEST MESSAGE	NUMBER	MEAN (STANDARD DEVIATION)
Oral Health		
Water fluoridation boosts your family's protection against tooth decay by 25% or more, saving you money on potentially costly dental treatment.	122	3.68 (0.99)
Just like seat belts and airbags work together to keep us safe, fluoride in water adds to the protection your family gets from fluoridated toothpaste and other dental products.	103	3.65 (1.05)
Fluoridated water saves smiles!	122	3.63 (0.95)
Water fluoridation provides an added layer of protection for your family's teeth.	127	3.53 (1.09)
Water fluoridation makes families healthier.	235	3.45 (1.03)
Water fluoridation saves smiles.	233	3.44 (1.05)
We rely on fluoride in water to add to the protection we get from toothpaste and dental visits, much like we rely on the fire station in addition to the smoke alarms or fire extinguishers we may have at home.	119	3.46 (1.11)
Water fluoridation makes communities healthier.	234	3.39 (1.05)
Health Equity		
Water fluoridation benefits everyone. It helps people of all ages and incomes, especially people who cannot see a dentist regularly.	88	3.61 (1.10)
The average 11-year-old brushes less than 50% of the surface of their teeth. Drinking fluoridated water adds a layer of protection for your family's teeth.	117	3.58 (1.00)
Children living in areas without fluoridated water are 32% more likely to have decayed, filled, or missing teeth.	77	3.34 (1.10)
Community Water Fluoridation Safety		
Water fluoridation is safe and effective.	236	3.45 (1.03)
Fluoride can be naturally occurring in water. Adding fluoride is like fortifying milk with vitamin D, orange juice with calcium, or cereals with B vitamins and folic acid.	69	3.43 (1.06)
Cost-effectiveness		
Water fluoridation saves families money by reducing the need for the expensive treatment of tooth decay.	111	3.46 (1.06)
For most cities, every $1 invested in water fluoridation saves $32 in dental treatment costs.	110	3.34 (0.97)
Water fluoridation is the most cost-efficient method for reducing tooth decay for all people.	123	3.34 (1.14)
Water fluoridation saves communities money.	235	3.20 (1.02)
Water fluoridation saves families money.	236	3.19 (1.02)
Social Well-being		
Children with good dental health are more likely to do well in school.	116	3.40 (1.16)
Children with poor dental health are nearly 3 times more likely to miss school and are 4 times more likely to earn lower grades.	97	3.26 (1.33)
People with unhealthy or missing teeth are at a disadvantage on the job market. Adults who had access to fluoridated water during childhood earn about 2% more each year.	125	3.17 (1.17)

* Community water fluoridation support measured on a 5-point scale: 1, very unlikely; 2, somewhat unlikely; 3, neutral; 4, somewhat likely; 5, very likely.

RESULTS

Participants (n = 245) were predominantly female (64%) and non-Hispanic White (47%) and reported living in mainly urban ZIP codes (82%) with household incomes of $50,000 or greater (65%). Table 2 provides the demographic details for our sample. Most respondents (52%) did not know if the water in their home was fluoridated, indicating limited awareness of the status of CWF in their communities. Only 7% of participants did not use products containing fluoride, such as fluoride toothpaste, suggesting respondents are not fluoride averse.

Bivariate analyses show significant, positive correlations among participant sex (being female), education (having a college degree), age, and CWF support. In addition, living in a rural area or identifying as White or Asian was positively correlated with CWF support; identifying as Black was

Table 2. Demographics of participants.*

CHARACTERISTIC	%†
Age, Mean (SD), y	36.47 (7.95)
Sex, Female	64
Urban Residents	82
Race and Ethnicity	
Non-Hispanic White	47
Non-Hispanic Black	16
Non-Hispanic Asian	5
Hispanic	27
Multiracial	4
Other	2
Education	
Some high school, no diploma	2
High school diploma	24
Some college, no degree	28
Associate degree	13
Bachelor's degree	26
Graduate degree	8
Household Income	
< $25,000	9
$25,000-$49,999	26
$50,000-$74,999	42
$75,000-$99,999	11
≥ $100,000	12

* Number of participants: 245. † Unless indicated otherwise.

negatively correlated with support. Income (< $50,000 or ≥ $50,000) and Hispanic identity were not related to support. However, none of the demographic covariates remained significant in multivariate tests of our research questions and hypotheses.

Research question 1 asked whether the 5 message themes lead to varying levels of support for CWF. Results show support varied significantly by the 5 message themes ($F_{4,16.48} = 13.708$; $P < .001$) after covarying out the demographic and prior beliefs variables and controlling for the fixed order of the first 6 messages. The level of support for each theme was as follows: oral health (LSM, 3.52; CI, 3.43 to 3.61), health equity (LSM, 3.43; CI, 3.32 to 3.55), CWF safety (LSM, 3.49; CI, 3.37 to 3.61), cost-effectiveness (LSM, 3.30; CI, 3.21 to 3.39), and social well-being (LSM, 3.21; CI, 3.10 to 3.32). Sidak post hoc test shows that CWF support was significantly higher in response to oral health messages than to messages emphasizing cost-effectiveness ($P < .001$) or social well-being ($P < .001$). Compared with social well-being messages, health equity ($P = .01$) and CWF safety messages ($P = .008$) also generated higher levels of support. There were no significant differences among oral health, health equity, and safety messages or among health equity, safety, and cost messages.

Hypotheses 1, 2, and 3 examined the effect of preexisting beliefs on CWF support. Belief that CWF has health benefits was significant and positively associated with CWF support ($b = 0.28$; CI, 0.18 to 0.40; $P < .001$). Thus, hypothesis 1 is supported. The association between worry about potential health risks and CWF support was not significant. Thus, hypothesis 2 is not supported. Normative beliefs, when significant, were positively associated with CWF support as predicted. However, only family ($b = 0.17$; CI, 0.05 to 0.30; $P = .01$) and physician ($b = 0.28$; CI, 0.15 to 0.41; $P < .001$) normative beliefs were significant predictors of CWF support.

Research question 2 and research question 3 asked whether prior beliefs including normative beliefs about CWF differed by message theme. To address these questions, we added 6 interaction

terms to the mixed-effects model—1 for each of the preexisting personal and normative beliefs by the message theme variable. The results of the interaction terms were not significant, suggesting the influence of preexisting beliefs on support does not vary by message theme.

DISCUSSION

Horowitz[30] forecasted that the future of water fluoridation would depend on public perception more than the veracity of scientific evidence. With more state and local jurisdictions relying on referendums to determine whether to fluoridate their community water supplies, it is important to understand how CWF promotion messages resonate with the public and motivate support. Our study suggests that messages focused on oral health, the safety of CWF, and CWF's role as a buffer against disparities in access to dental care and oral hygiene practices may be more promising for promoting support. Messages focused on social well-being factors such as school and job outlook were not as effective as any of the former message frames. Oral health messages also yielded greater support than messages focused on the cost-effectiveness of CWF.

Consistent with past research, the perception that there are health benefits of CWF positively predicted support.[18] Our findings suggest that believing CWF has health benefits increases support regardless of message theme. However, worry about the potential health risks associated with CWF was not a significant predictor of support. This finding is at odds with past research, which has shown that worry decreases support.[19] One possible explanation for this difference is that prior research did not consider exposure to messages that promote CWF as we do in our study. Worry may no longer affect support when the influence of messaging is taken into account. If so, this further underscores the importance and potential of CWF promotion efforts.

Given that CWF is a public health issue, we also considered the role of norms. Our findings are in line with those of other studies showing norm perceptions positively influence oral health behaviors[21,22] as well as with research suggesting normative effects may vary by referent social group.[23,24] In this case, beliefs that one's family and physician think CWF is a good thing were both positively associated with CWF support, but similar beliefs about one's community and dentist were not significant predictors. There were no differences when considering specific aspects of CWF—family and physician norms were related to support regardless of message theme. Although dentist norms were not a predictor of support, the practical implication of this result should be considered with caution. Mean ratings for perceptions that family dentists approve of CWF trended higher, and more participants indicated trusting dentists (65.4%) than physicians (56.0%) as a source of information for CWF. It could be that people expect dentists to support fluoride but view CWF as something that affects their entire bodies, not just their mouths. Family physicians' approval may operate as a subconscious endorsement of CWF above and beyond the role of family dentists. Additional research is needed to understand these differences; still, CWF campaign planners should consider the role of both family physicians and dentists in promoting CWF.

In general, message ratings were higher than neutral, but differences among themes can be interpreted in terms of their relative effectiveness in shifting perceptions toward greater support. Although these differences, including the effect of preexisting beliefs, are small, we know from prior health communication research that small shifts in response to messaging are meaningful when considered at a population level as well as in tandem with other health promotion tools.[31,32]

Limitations

Our findings should be considered in the context of a few limitations including the quasi-experimental design and correlational nature of some analyses. Using existing messages about CWF provided ecological validity, and our mixed-effects models suggest differences among individual messages did not influence the results, but we could not fully control for these variations. The number of observations for each message also varied, with some participants seeing no messages from certain themes, raising the potential for reduced model power, biased effect estimates, or both. In practice, however, the distribution of messages in a population is not often balanced. Mixed-effects models are robust in handling violations of equal sample size and variance assumptions, and the within-participants design and total number of theme-level observations also increased power. Whereas the personal belief and family and physician norm variables were significant predictors of CWF support, we did not manipulate normative beliefs. Thus, these relationships are

purely correlational, not causal. There may also be differences between self-reported support and how participants actually respond to this issue.

Although our results can help guide local and national CWF promotion efforts, our data only reflect Texas residents and we only sampled parents. Caries is one of the most common chronic diseases affecting children and adolescents,[33] and thus parents are an important audience to consider given the relevance of CWF to their family's health. Still, responses among other groups may differ. In addition, Hispanic parents and parents without a high school degree were underrepresented in our data.[34] Although neither Hispanic identity nor education level predicted outcomes in our study, prior research suggests greater use of bottled water among Hispanic populations,[28] and knowledge of and support for CWF has consistently been found to be lower among people with lower levels of education.[10]

Future research

To address these limitations and additional questions raised, future studies should recruit a larger, more diverse sample including greater representation of Hispanic participants and people with lower levels of education. Future research should also consider whether including normative information as part of the message further increases support and whether this is dependent on the specific reference group highlighted. Finally, follow-up studies can evaluate the role of messaging in mitigating worries about the risks associated with CWF and examine behavioral outcomes such as signing a petition or engaging in other policy-related activities.

CONCLUSIONS

This study is among the first, to our knowledge, to examine the impact of messaging on audience support of fluoridated water. Oral health care providers and educators may use this evidence to guide decisions about the focus of CWF campaigns. In particular, they may want to focus efforts on developing messages highlighting oral health, including health equity, and CWF safety. They may also want to collaborate with family physicians in promoting the benefits of CWF. ■

Dr. Kemp is an assistant professor, Stan Richards School of Advertising & Public Relations, Moody College of Communication, and a faculty affiliate, Center for Health Communication, University of Texas at Austin, 300 W Dean Keeton St (A1200), BMC 4.338, Austin, TX 78712, email dkemp@austin.utexas.edu. Address correspondence to Dr. Kemp.

Dr. Mackert is the director, Center for Health Communication, and a professor, Stan Richards School of Advertising & Public Relations, Moody College of Communication, and Department of Population Health, University of Texas at Austin, Austin, TX.

Ms. Bouchacourt is a doctoral candidate, Stan Richards School of Advertising & Public Relations, Moody College of Communication, University of Texas at Austin, Austin, TX.

Dr. Lazard is the E. Reese Felts Jr. Distinguished Associate Professor, Hussman School of Journalism and Media, University of North Carolina at Chapel Hill, Chapel Hill, NC; and a faculty affiliate, Center for Health Communication, University of Texas at Austin, Austin, TX.

Dr. Wolfe was the director of the Oral Health Program, Texas Health Institute, Austin, TX, when this study was conducted. She is now an assistant professor, Department of Public Health, A.T. Still University, Kirksville, MO.

Ms. Stewart is the executive director, Texas Oral Health Coalition, Midland, TX.

Dr. Kahlor is a professor, Stan Richards School of Advertising & Public Relations, Moody College of Communication, and a faculty affiliate, Center for Health Communication, University of Texas at Austin, Austin, TX.

Ms. George was a senior project coordinator, Center for Health Communication, University of Texas at Austin, Austin, TX, when the work described in this article was conducted. She now is the assistant director for marketing and communications, Texas Global, University of Texas at Austin, Austin, TX.

Ms. Wagner is the deputy director, Center for Health Communication, University of Texas at Austin, Austin, TX.

Dr. Wilcox is the John A. Beck Centennial Professor in Communication, Stan Richards School of Advertising & Public Relations, Moody College of Communication, an associated faculty, Department of Statistics and Data Sciences, and a faculty affiliate, Center for Health Communication, University of Texas at Austin, Austin, TX.

Disclosure. This research was supported by the Delta Dental Community Care Foundation Oral Health Education Fund.

1. Centers for Disease Control and Prevention. 75 Years of Community Water Fluoridation: Basic Tips for Good Oral Health. Accessed June 14, 2021. https://www.cdc.gov/fluoridation/basics/anniversary.htm

2. Neidell M, Herzog K, Glied S. The association between community water fluoridation and adult tooth loss. *Am J Public Health*. 2010;100(10):1980-1985.

3. Slade GD, Grider WB, Maas WR, Sanders AE. Water fluoridation and dental caries in US children and adolescents. *J Dent Res*. 2018;97(10):1122-1128.

4. Kumar JV, Adekugbe O, Melnik TA. Geographic variation in Medicaid claims for dental procedures in New York State: role of fluoridation under contemporary conditions. *Public Health Rep*. 2010;125(5):647-654.

5. Ran T, Chattopadhyay SK; Community Preventive Services Task Force. Economic evaluation of community water fluoridation: a community guide systematic review. *Am J Prev Med*. 2016;50(6):790-796.

6. Glied S, Neidell M. The economic value of teeth. *J Hum Resour*. 2010;45(2):468-496.

7. Chuck E. *Science Says Fluoride in Water Is Good for Kids. So Why Are These Towns Banning It?* NBC News. October 17, 2018. Accessed June 14, 2021. https://www.nbcnews.com/news/us-news/science-says-fluoride-water-good-kids-so-why-are-these-n920851

8. Texas Health Institute. *Oral Health in Texas: Bridging Gaps and Filling Needs*. 2018. Accessed June 14, 2021. https://www.texashealthinstitute.org/uploads/3/9/5/2/39521365/thi_report_final.pdf

9. American Dental Association. *Fluoridation Facts*. 2018. Accessed June 14, 2021. https://www.readcube.com/articles/10.1111%2Fj.1752-7325.1955.tb01558.x

10. Mork N, Griffin S. Perceived safety and benefit of community water fluoridation: 2009 HealthStyles survey. *J Public Health Dent*. 2015;75(4):327-336.

11. Curiel JA, Sanders AE, Christian TML, et al. Fluoridation advocacy in referenda where media coverage is balanced yet biased. *JADA*. 2018;149(4):273-280.e3.

12. Allukian M Jr., Carter-Pokras OD, Gooch BF, et al. Science, politics, and communication: the case of community water fluoridation in the US. *Ann Epidemiol*. 2018; 28(6):401-410.

13. Chadwick A, Lamia T, Zaro-Moore J; *Exploring Factors Associated with Fluoridation Referenda Outcomes*. US Department of Health and Human Services, Centers for Disease Control and Prevention. 2008. Accessed June 15, 2021. http://fluoridealert.org/wp-content/uploads/chadwick.hhs-cdc-20081.pdf

14. Manchir M. *'I Love Fluoride' Campaign Proves Effective in New York*. ADA News. October 1, 2018. Accessed June 14, 2021. https://www.ada.org/en/publications/ada-news/2018-archive/october/i-love-fluoride-campaign-proves-effective-in-new-york

15. Krisberg K. Public health messaging: how it is said can influence behaviors: beyond the facts. *Nations Health*. 2014;44(6):1-20.

16. Yeung CA. A systematic review of the efficacy and safety of fluoridation. *Evid Based Dent*. 2008;9(2):39-43.

17. Burt BA. Fluoridation and social equity. *J Public Health Dent*. 2002;62(4):195-200.

18. Armfield JM, Akers HF. Community water fluoridation support and opposition in Australia. *Community Dent Health*. 2011;28(1):40-46.

19. Furukawa S, Hagiwara Y, Taguchi C, Turumoto A, Kobayashi S. Associations between oral health behavior and anxiety about water fluoridation and motivation to establish water fluoridation in Japanese residents. *J Oral Sci*. 2011;53(3):313-319.

20. Perrella AML, Kiss SJ. Risk perception, psychological heuristics and the water fluoridation controversy. *Can J Public Health*. 2015;106(4):e197-e203.

21. Tedesco LA, Keffer MA, Fleck-Kandath C. Self-efficacy, reasoned action, and oral health behavior reports: a social cognitive approach to compliance. *J Behav Med*. 1991;14(4):341-355.

22. Jönsson B, Baker SR, Lindberg P, Oscarson N, Öhrn K. Factors influencing oral hygiene behaviour and gingival outcomes 3 and 12 months after initial periodontal treatment: an exploratory test of an extended theory of reasoned action. *J Clin Periodontol*. 2012;39(2):138-144.

23. Eckhardt A, Laumer S, Weitzel T. Who influences whom? Analyzing workplace referents' social influence on IT adoption and non-adoption. *J Inf Technol*. 2009;24(1): 11-24.

24. Larimer ME, Kaysen DL, Lee CM, et al. Evaluating level of specificity of normative referents in relation to personal drinking behavior. *J Stud Alcohol Drugs Suppl*. 2009;(16):115-121.

25. Yun D, Silk KJ. Social norms, self-identity, and attention to social comparison information in the context of exercise and healthy diet behavior. *Health Commun*. 2011;26(3):275-285.

26. Arora A, Evans RW, Sivaneswaran S, Sujeer AN, Blinkhorn AS. Parental support for water fluoridation in Lithgow, New South Wales. *Aust Dent J*. 2010;55(4):417-422.

27. Health Resources and Services Administration (HRSA). *Federal Office of Rural Health Policy (FORHP) Data Files: FORHP Eligible ZIP Codes*. US Department of Health & Human Services, Health Resources and Services Administration. Last reviewed January 2021. Accessed June 15, 2021. https://www.hrsa.gov/rural-health/about-us/definition/datafiles.html

28. Scherzer T, Barker JC, Pollick H, Weintraub JA. Water consumption beliefs and practices in a rural Latino community: implications for fluoridation. *J Public Health Dent*. 2010;70(4):337-343.

29. Norman G. Likert scales, levels of measurement and the "laws" of statistics. *Adv Heal Sci Educ*. 2010;15(5):625-632.

30. Horowitz HS. The effectiveness of community water fluoridation in the United States. *J Public Health Dent*. 1996;56(5):253-258.

31. Brewer NT, Hall MG, Noar SM, et al. Effect of pictorial cigarette pack warnings on changes in smoking behavior: a randomized clinical trial. *JAMA Intern Med*. 2016;176(7):905-912.

32. Frieden TR. A framework for public health action: the health impact pyramid. *Am J Public Health*. 2010; 100(4):590-595.

33. Dye BA, Mitnik GL, Iafolla TJ, Vargas CM. Trends in dental caries in children and adolescents according to poverty status in the United States from 1999 through 2004 and from 2011 through 2014. *JADA*. 2017;148(8): 550-565.e7.

34. Annie E. Casey Foundation. *Kids Count Data Center: Texas Indicators*. Annie E. Casey Foundation; 2021. Accessed June 15, 2021. https://datacenter.kidscount.org/data≠TX/2/0